

A 1-Year Cost Avoidance Model of a Retrograde Flushing System for Ventricular Catheters in Pediatric Hydrocephalus Patients

Introduction

A retrograde flushing system may non-surgically resolve proximal occlusion of shunts in hydrocephalus patients, reducing revision surgeries. Additionally, this system could increase the threshold for cerebrospinal fluid (CSF) protein levels at which surgeons are comfortable implanting shunts. Although data is limited, new shunts have been implanted with a retrograde flushing system at protein levels >1000mg/dl without subsequent obstruction, avoiding the need to use external ventricular drains (EVD). The potential for cost avoidance is significant.

Methods

An economic model was created to estimate potential cost savings associated with retrograde flushing systems in 100 pediatric (1-18 years) hydrocephalus procedures (50 primary and 50 revision shunt procedures) using the 2016 National Inpatient Sample (NIS: N=6,135 pediatric shunt procedure discharges), cost-to-charges ratios, and available literature. Potential cost savings were estimated from the NIS charges for shunt revision surgery and previously reported rates of shunt failure due to catheter/valve occlusion. Cost-saving estimates from increasing CSF protein level threshold were based on average LOS between EVD placement and shunt surgery in the NIS data. LOS between EVD placement and shunt insertion factored an average 10-day antibiotic course for shunt infections, which would not be eliminated with a retrograde flushing device.

Results

From 2016 estimates, average pediatric shunt revision = \$25,200, with 63% of revisions attributed to occlusion. Assuming 50% occlusion reduction, \$313,551 per 100 procedures could be saved. Additionally, EVD usage prior to shunt surgery was 28.2% of primary and 9.4% of revision surgeries; averaging 8.9 and 7.9 additional LOS days respectively. Eliminating these LOS days would provide \$3,543 in savings per patient per day, for a total additional savings of \$576,639 per 100 procedures.

Conclusion

Although data on the performance of retrograde flushing systems is limited, this model-based analysis suggests these systems could provide a cost avoidance of \$890,190 per 100 shunt procedures.